# TIDELAND SIGNAL CORPORATION
RL14 & FA-240 LEDBULLET RETROFIT KIT
INSTALLATION & SERVICING INSTRUCTIONS

Advances in Light Emitting Diode (LED) technology have enable us to duplicate the output of most 12 VDC filament lamps used in the RL14 and FA-240 range lanterns with direct emitting LED retrofit assemblies. The kit replaces all of the optical components used inside the range lantern. The mirror, lampchanger, flasher and lamps are replaced with the "LEDBullet" retrofit kit. The existing spread lens is used with the kit to achieve the desired horizontal divergence.

LED Color
Check Boxes

FA-240 Version

RL14 Version
(15-Head shown)
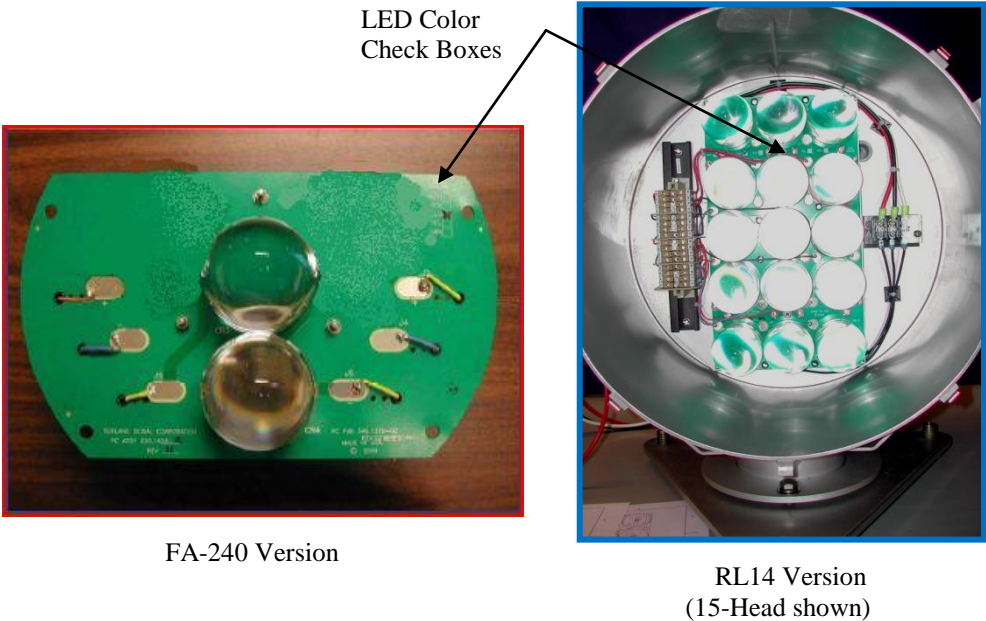
LEDBullets for RL14 lanterns contain 2, 4, 8, 10, 12 or 15 LEDs. LEDBullets with 2, 4, 8, 12 and 15 LEDs are available on contract (the 10 LED bullet was available very early in the program but is no longer available). The light intensity depends on the number of LEDs that are powered and a user-adjustable power setting. By making wiring changes an LEDBullet can also be programmed to power fewer LEDs than are available on the Bullet. For example, an LEDBullet with 15 LEDS can be rewired to only power 10 of the 15 LEDs. Here are the options:

Number of LEDs on Bullet	LEDs Used Options
15	15, 10, 4, 2
12	12, 10, 4, 2
8	8, 4, 2
4	4, 2
2	2

This makes the LEDBullet very versatile as only one 15-LED RL14 Bullet for each color installed in the ANT's AOR is needed as a spare for RL14 lanterns. The spare 15- LED Bullet can be used until the proper LEDBullet is reordered and installed.

For new conversions, purchase the number of LEDs required to achieve the desired intensity. Due to the limited number of FA-240s in service, only 2-head LEDBullets are used.

It is not apparent what color will be displayed from the LEDs as all lenses are clear. The LEDBullet color is marked in a box on the circuit board between lenses, as shown above.

Purchase

A Blanket Purchase Agreement (BPA) has been established with Tideland Signal Corporation. The 2, 4, 8, 12 and 15 head LEDBullets along with the MLED-120 LED lantern are available on this contract. Ordering information is available via the CG Portal accessed via the Ocean Engineering website: http://www.uscg.mil/hq/cg4/cg432/products.asp.

LED Color & Spread Lenses

The LED color determines the signal color, not the lens, i.e., a **white** LEDBullet cannot be used with a *yellow, red* or *green* spread lens. A **red** LEDBullet can be used with a *red* or *clear* spread lens, the **yellow** LEDBullet with a *yellow* or *clear* spread lens, and the **green** LEDBullet with a *green* or *clear* spread lens. The green LEDBullet is a poor color match to the green spread lenses therefore a substantial increase of intensity is possible using a clear spread lens (see intensity tables). NOTE: because of the difficulty of changing spread lenses due to seized fasteners, consider retaining the existing spread lens. For new installations the color and angle of the spread lens can be optimized.

Tools Needed

To program and install the LEDBullet, the following tools are needed:

1/8" wide flat tipped screwdriver

1/4" wide flat tipped screwdriver

#2 Phillip's screwdriver

#3 Square drive screwdriver (for VLB-67-SA)

5/16" Nut driver (for VLB-67-SA)

5/32" Allen wrench, long (supplied with LEDBullet)

Adjustable crescent wrench (for FA-240)

Wire Strippers

Heat Sink Grease (supplied with LEDBullet or Radio Shack 276-1372)

Popsicle Stick or similar for spreading heat sink grease

Electrical tape or duct tape

Mild soap & water

Soft rag or cloth

Desiccant Bags

Programming

The LED assemblies must be programmed to the proper flash rhythm, intensity and bench tested in the shop before deployment. The number of LEDs energized <u>and</u> the intensity setting must be configured before transiting to the aid. While it is more economical to purchase the correct number of LEDs for the particular installation, a LEDBullet with more LEDs can be used if some of the LEDs are turned off, which is useful for discrepancy response.

Intensity

Most RL14 lanterns have a spread lens (3, 8, 11, 20 or 28 degree). The LEDBullet has sufficient horizontal divergence such that a spread lens may not be needed to provide adequate coverage in the waterway. The existing spread lens can be replaced with clear glass for increased intensity if the following <u>horizontal</u> divergences are acceptable:

<u>RL14 Vertical Divergence **and** Horizontal Divergence Using a Clear Glass Lens</u>

White - 2.5 degrees (to 50% peak intensity, 1.25 degrees either side of rangeline)

Green - 2.9 degrees, Red - 3.1 degrees, Yellow - 3.2 degrees

The FA-240 is generally fitted with 3.5 or 8 degree spread lenses. Retain the original lens when outfitting that lantern with a 2-head LEDBullet. The lantern's horizontal divergence will be determined by the spread lens. The vertical divergence will be:

<u>FA-240 Vertical Divergence Using all spread lenses</u>

White - 2.5 degrees (to 50% peak intensity)

Green - 2.5 degrees, Red – 2.9 degrees

Lantern intensity tables are provided below. As an alternative to using the tables in this instruction, intensity options for LEDBullets in an RL14 are shown in the right margin of the Ranges Solar Sizing program. The table in the right margin of the Ranges Solar Sizing program also compares LEDBullet intensities to RL14 intensities using incandescent lamps.

 Before making any changes to a range it is always recommended that the Range Design program be used to verify the required intensities.

The Ranges Solar Sizing program and the Range Design program are available on the Ocean Engineering website: http://www.uscg.mil/hq/cg4/cg432/publications.asp

IMPORTANT INTENSITY NOTE: The tables below show the intensity during the flash. This is greater than the traditional effective intensity. As of May 2014 the Coast Guard uses intensity during the flash to design and evaluate a range because intensity during the flash provides a better indication of apparent brightness than does effective intensity.

Intensities – in Candela

RL14 White LEDBullet 0 Deg (Clear Glass)

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	2200	0.024
2	0110	3300	0.030
2	1010	8000	0.058
4	0010	15,000	0.085
8	1100	41,000	0.230
8	0100	60,000	0.324
8	1000	92,000	0.483
8	0000	117,000	0.610
10*	0000	166,000	0.775
12	0000	199,000	0.917
15	1010	160,000	0.921
15	0010	180,000	1.059
15	1100	240,000	1.368
15	0100	340,000	1.911
15	1000	520,000	2.788
15	0000	650,000	3.482

RL14 White LEDBullet 3 Deg Clear Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	1700	0.024
2	0110	2500	0.030
2	1010	6100	0.058
4	0010	12,000	0.085
8	1100	33,500	0.230
8	0100	49,300	0.324
8	1000	75,000	0.483
8	0000	96,000	0.610
10*	0000	122,000	0.775
12	0000	146,000	0.917
15	1010	116,000	0.921
15	0010	131,000	1.059
15	1100	175,000	1.368
15	0100	248,000	1.911
15	1000	383,000	2.788
15	0000	479,000	3.482

Intensities – in Candela

RL14 White LEDBullet 8 Deg Clear Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	800	0.024
2	0110	1300	0.030
2	1010	3200	0.058
4	0010	6200	0.085
8	1100	17,000	0.230
8	0100	25,100	0.324
8	1000	38,500	0.483
8	0000	49,000	0.610
10*	0000	65,500	0.775
12	0000	78,800	0.917
15	1010	63,000	0.921
15	0010	71,000	1.059
15	1100	95,000	1.368
15	0100	135,000	1.911
15	1000	208,000	2.788
15	0000	260,000	3.482

RL14 White LEDBullet 11 Deg Clear Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	600	0.024
2	0110	900	0.030
2	1010	2100	0.058
4	0010	4500	0.085
8	1100	12,200	0.230
8	0100	17,900	0.324
8	1000	27,300	0.483
8	0000	34,900	0.610
10*	0000	43,600	0.775
12	0000	52,100	0.917
15	1010	44,000	0.921
15	0010	50,000	1.059
15	1100	67,000	1.368
15	0100	95,000	1.911
15	1000	149,000	2.788
15	0000	187,000	3.482

Intensities – in Candela

RL14 White LEDBullet 20 Deg Clear Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	300	0.024
2	0110	500	0.030
2	1010	1300	0.058
4	0010	2400	0.085
8	1100	6800	0.230
8	0100	10,000	0.324
8	1000	15,200	0.483
8	0000	19,400	0.610
10*	0000	24,700	0.775
12	0000	29,600	0.917
15	1010	24,000	0.921
15	0010	28,000	1.059
15	1100	37,000	1.368
15	0100	52,000	1.911
15	1000	81,000	2.788
15	0000	102,000	3.482

RL14 White LEDBullet 28 Deg Clear Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	200	0.024
2	0110	400	0.030
2	1010	900	0.058
4	0010	1800	0.085
8	1100	5200	0.230
8	0100	7600	0.324
8	1000	11,700	0.483
8	0000	14,900	0.610
10*	0000	18,800	0.775
12	0000	22,500	0.917
15	1010	19,000	0.921
15	0010	21,000	1.059
15	1100	29,000	1.368
15	0100	41,000	1.911
15	1000	63,000	2.788
15	0000	79,000	3.482

Intensities – in Candela

RL14 Yellow LEDBullet 0 Deg (Yellow or Clear) Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	0110	3600	0.045
4	1010	5200	0.058
8	0010	7900	0.083
10*	0010	10,600	0.103
12	0110	16,400	0.170
15	1100	25,500	0.254
15	0100	37,800	0.367
15	1000	58,200	0.558
15	0000	76,800	0.743

RL14 Yellow LEDBullet 3 Deg (Yellow or Clear) Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	0110	2100	0.045
4	1010	3300	0.058
8	0010	6300	0.083
10*	0010	7400	0.103
12	0110	13,000	0.170
15	1100	19,100	0.254
15	0100	28,300	0.367
15	1000	41,900	0.558
15	0000	55,200	0.743

RL14 Yellow LEDBullet 8 Deg (Yellow or Clear) Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	0110	1200	0.045
4	1010	1900	0.058
8	0010	3500	0.083
10*	0010	4600	0.103
12	0110	7300	0.170
15	1100	10,400	0.254
15	0100	15,300	0.367
15	1000	22,700	0.558
15	0000	30,000	0.743

Intensities – in Candela

RL14 Yellow LEDBullet 11 Deg (Yellow or Clear) Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	0110	700	0.045
4	1010	1100	0.058
8	0010	2100	0.083
10*	0010	2500	0.103
12	0110	4500	0.170
15	1100	6600	0.254
15	0100	9800	0.367
15	1000	14,500	0.558
15	0000	19,100	0.743

RL14 Yellow LEDBullet 20 Deg (Yellow or Clear) Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	0110	300	0.045
4	1010	500	0.058
8	0010	1100	0.083
10*	0010	1300	0.103
12	0110	2300	0.170
15	1100	3300	0.254
15	0100	5000	0.367
15	1000	7400	0.558
15	0000	9700	0.743

RL14 Yellow LEDBullet 28 Deg (Yellow or Clear) Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	0110	200	0.045
4	1010	400	0.058
8	0010	800	0.083
10*	0010	1000	0.103
12	0110	1700	0.170
15	1100	2500	0.254
15	0100	3800	0.367
15	1000	5600	0.558
15	0000	7400	0.743

Intensities – in Candela

RL14 Red LEDBullet 0 Deg (Red or Clear) Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	3800	0.050
2	0001	6100	0.073
4	1110	10,500	0.136
4	0110	14,600	0.168
4	1010	22,800	0.253
8	0010	27,400	0.293
10*	0010	36,100	0.367
12	0010	40,400	0.440
15	1100	51,400	0.500
15	0100	73,400	0.706
15	1000	101,000	0.981
15	0000	135,000	1.302

RL14 Red LEDBullet 3 Deg (Red or Clear) Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	2000	0.050
2	0001	3300	0.073
4	1110	7500	0.136
4	0110	9800	0.168
4	1010	14,900	0.253
8	0010	21,000	0.293
10*	0010	24,000	0.367
12	0010	31,000	0.440
15	1100	33,200	0.500
15	0100	47,200	0.706
15	1000	64,200	0.981
15	0000	86,000	1.302

Intensities – in Candela

RL14 Red LEDBullet 8 Deg (Red or Clear) Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	1100	0.050
2	0001	1800	0.073
4	1110	3900	0.136
4	0110	5000	0.168
4	1010	7800	0.253
8	0010	11,100	0.293
10*	0010	12,600	0.367
12	0010	16,400	0.440
15	1100	17,700	0.500
15	0100	25,100	0.706
15	1000	34,200	0.981
15	0000	45,600	1.302

RL14 Red LEDBullet 11 Deg (Red or Clear) Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	900	0.050
2	0001	1500	0.073
4	1110	3300	0.136
4	0110	4300	0.168
4	1010	6600	0.253
8	0010	9300	0.293
10*	0010	10,500	0.367
12	0010	13,800	0.440
15	1100	15,100	0.500
15	0100	21,100	0.706
15	1000	29,100	0.981
15	0000	38,500	1.302

Intensities – in Candela

RL14 Red LEDBullet 20 Deg (Red or Clear) Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	500	0.050
2	0001	800	0.073
4	1110	1800	0.136
4	0110	2300	0.168
4	1010	3500	0.253
8	0010	5200	0.293
10*	0010	5800	0.367
12	0010	7700	0.440
15	1100	8800	0.500
15	0100	12,300	0.706
15	1000	16,500	0.981
15	0000	21,700	1.302

RL14 Red LEDBullet 28 Deg (Red or Clear) Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	400	0.050
2	0001	700	0.073
4	1110	1400	0.136
4	0110	1800	0.168
4	1010	2700	0.253
8	0010	4100	0.293
10*	0010	4500	0.367
12	0010	6100	0.440
15	1100	7100	0.500
15	0100	9700	0.706
15	1000	13,100	0.981
15	0000	17,400	1.302

Intensities – in Candela

RL14 Green LEDBullet 0 Deg Green Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	3000	0.077
2	0001	4100	0.098
2	1110	9300	0.183
2	0110	11,900	0.230
4	1010	18,400	0.323
4	0010	31,900	0.548
8	1100	57,000	0.627
10*	1100	45,400	0.744
10*	0100	64,800	1.029
12	1000	99,000	1.128
15	1000	87,800	1.403
15	0000	119,000	1.862

RL14 Green LEDBullet 3 Deg Green Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	2600	0.077
2	0001	3700	0.098
2	1110	8300	0.183
2	0110	10,600	0.230
4	1010	16,900	0.323
4	0010	29,500	0.548
8	1100	30,000	0.627
10*	1100	41,000	0.744
10*	0100	58,700	1.029
12	1000	57,600	1.128
15	1000	79,500	1.403
15	0000	106,000	1.862

Intensities – in Candela

RL14 Green LEDBullet 8 Deg Green Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	1200	0.077
2	0001	1700	0.098
2	1110	3900	0.183
2	0110	5000	0.230
4	1010	7700	0.323
4	0010	13,400	0.548
8	1100	14,000	0.627
10*	1100	19,400	0.744
10*	0100	27,800	1.029
12	1000	27,000	1.128
15	1000	38,800	1.403
15	0000	52,000	1.862

RL14 Green LEDBullet 11 Deg Green Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	1000	0.077
2	0001	1400	0.098
2	1110	3200	0.183
2	0110	4100	0.230
4	1010	6600	0.323
4	0010	11,600	0.548
8	1100	12,000	0.627
10*	1100	16,700	0.744
10*	0100	23,800	1.029
12	1000	23,000	1.128
15	1000	33,300	1.403
15	0000	44,900	1.862

Intensities – in Candela

RL14 Green LEDBullet 20 Deg Green Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	500	0.077
2	0001	700	0.098
2	1110	1700	0.183
2	0110	2200	0.230
4	1010	3600	0.323
4	0010	6300	0.548
8	1100	6500	0.627
10*	1100	9200	0.744
10*	0100	13,200	1.029
12	1000	12,500	1.128
15	1000	18,200	1.403
15	0000	24,500	1.862

RL14 Green LEDBullet 28 Deg Green Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	400	0.077
2	0001	500	0.098
2	1110	1200	0.183
2	0110	1600	0.230
4	1010	2600	0.323
4	0010	4500	0.548
8	1100	4700	0.627
10*	1100	6600	0.744
10*	0100	9300	1.029
12	1000	9000	1.128
15	1000	13,700	1.403
15	0000	18,200	1.862

Intensities – in Candela

RL14 Green LEDBullet 0 Deg <u>Clear</u> Glass

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	5000	0.077
2	0001	7000	0.098
2	1110	15,900	0.183
2	0110	20,400	0.230
4	1010	31,500	0.323
4	0010	54,800	0.548
8	1100	57,000	0.627
10*	1100	78,000	0.744
10*	0100	111,000	1.029
12	1000	99,000	1.128
15	1000	152,000	1.403
15	0000	204,000	1.862

RL14 Green LEDBullet 3 Deg <u>Clear</u> Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	4000	0.077
2	0001	5700	0.098
2	1110	12,900	0.183
2	0110	16,600	0.230
4	1010	26,200	0.323
4	0010	45,600	0.548
8	1100	47,000	0.627
10*	1100	65,000	0.744
10*	0100	92,700	1.029
12	1000	89,800	1.128
15	1000	123,000	1.403
15	0000	167,000	1.862

Intensities – in Candela

RL14 Green LEDBullet 8 Deg <u>Clear</u> Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	2200	0.077
2	0001	3100	0.098
2	1110	7100	0.183
2	0110	9200	0.230
4	1010	14,500	0.323
4	0010	25,200	0.548
8	1100	26,400	0.627
10*	1100	35,900	0.744
10*	0100	57,500	1.029
12	1000	50,500	1.128
15	1000	70,200	1.403
15	0000	94,700	1.862

RL14 Green LEDBullet 11 Deg <u>Clear</u> Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	1500	0.077
2	0001	2100	0.098
2	1110	4800	0.183
2	0110	6300	0.230
4	1010	10,700	0.323
4	0010	16,800	0.548
8	1100	18,700	0.627
10*	1100	26,500	0.744
10*	0100	37,600	1.029
12	1000	35,800	1.128
15	1000	52,200	1.403
15	0000	70,200	1.862

Intensities – in Candela

RL14 Green LEDBullet 20 Deg <u>Clear</u> Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	900	0.077
2	0001	1200	0.098
2	1110	2800	0.183
2	0110	3600	0.230
4	1010	6000	0.323
4	0010	10,400	0.548
8	1100	10,800	0.627
10*	1100	15,700	0.744
10*	0100	22,200	1.029
12	1000	15,700	1.128
15	1000	29,900	1.403
15	0000	40,200	1.862

RL14 Green LEDBullet 28 Deg <u>Clear</u> Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1001	700	0.077
2	0001	900	0.098
2	1110	2100	0.183
2	0110	2700	0.230
4	1010	4500	0.323
4	0010	7800	0.548
8	1100	8100	0.627
10*	1100	12,000	0.744
10*	0100	16,300	1.029
12	1000	15,500	1.128
15	1000	23,100	1.403
15	0000	31,100	1.862

*Note – 10-head LEDBullets are not on contract. Use a 12-head LEDBullet for 10-head LEDBullet installations (when possible) or use a 15-head LEDBullet with 5 LEDs turned off.

Intensities – in Candela

FA-240 White LEDBullet 3.5 Deg Clear Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	3500	0.050
2	1001	10,000	0.135
2	0110	19,000	0.250
2	0010	40,000	0.505
2	0000	47,500	0.605

FA-240 White LEDBullet 8 Deg Clear Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	2000	0.050
2	1001	6000	0.135
2	0110	11,000	0.250
2	0010	23,500	0.505
2	0000	28,500	0.605

FA-240 Red LEDBullet 3.5 Deg Red Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	800	0.024
2	1001	2500	0.061
2	0110	4500	0.110
2	0010	9500	0.225
2	0000	11,000	0.270

FA-240 Red LEDBullet 8 Deg Red Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	500	0.024
2	1001	1500	0.061
2	0110	2500	0.110
2	0010	5000	0.225
2	0000	6000	0.270

Intensities – in Candela

FA-240 Green LEDBullet 3.5 Deg Green Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	900	0.033
2	1001	2800	0.085
2	0110	5500	0.165
2	0010	11,500	0.325
2	0000	14,000	0.395

FA-240 Green LEDBullet 8 Deg Green Spread Lens

Number of LEDs	Power Setting	Intensity (cd)	Amps
2	1110	500	0.033
2	1001	1600	0.085
2	0110	3300	0.165
2	0010	6700	0.325
2	0000	8000	0.395

Solar Sizing

The Ranges Solar Sizing Program can be used to size a power system for an aid with an RL14 or FA-240 that uses an LED bullet: http://www.uscg.mil/hq/cg4/cg432/publications.asp. The printout provides the number of LEDs used and the intensity power level to assist with programming the LEDBullet

Rev 4.3, 18 August 2014

Configure the LEDBullet

Review the district work order and determine the required flash rhythm, color, intensity and spread lens. Using the tables on the previous pages, determine the number of LEDs required and the power setting for the LEDBullet. For the following example, the LEDBullet will use 4 LEDs with a power setting of 0010.

Pulse Sync Lead for CG-504 Flasher & VLB-67-SA Lantern

Daylight Control Terminals, Block J5

ASCII synchronization and dimming switch S4

Intensity Micro Switch S5; ON is "1", Off is "0" Above example is **0010**

Flash Rhythm Selector S1

ASCII Sync Output. Center Terminal of Block J6 for another LEDBullet or MLED-120 lantern
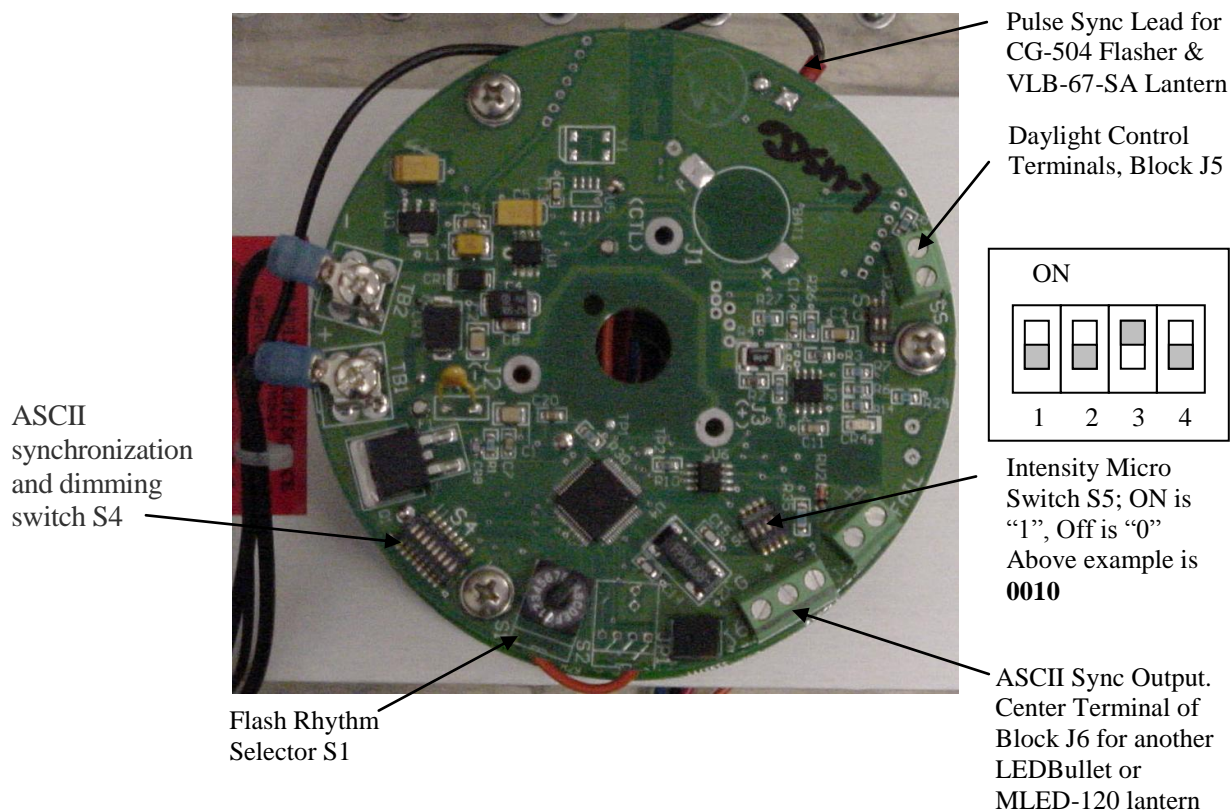
On the LEDBullet flasher/driver, the switch S1 pictured above is used to set the flash rhythm. Determine the proper rhythm for the aid and select the switch setting according to the table shown on the next page. Lay the LEDBullet assembly on a soft cloth and rotate switch S1 so the "window" exposes the correct setting.

S1 Setting	Flash Rhythm	Timing On/Off Sec	Duty Cycle [%]
0	Fixed		100
1	Fl2.5	1.0/1.5	40
2	Q	0.3/0.7	30
3	Iso2	1.0/1.0	50
4	Iso6	3.0/3.0	50
5	Oc4	3.0/1.0	75

20

Intensity selection is accomplished by moving jumpers on the outside of the terminal board to select the **number** of LEDs used, AND setting the dip switches (S5) located on the LED Flasher/Driver to get the correct power setting.   This is for the RL14 version only. The 2-head LEDBullet is the only version used in the FA-240 and does not use jumpers.
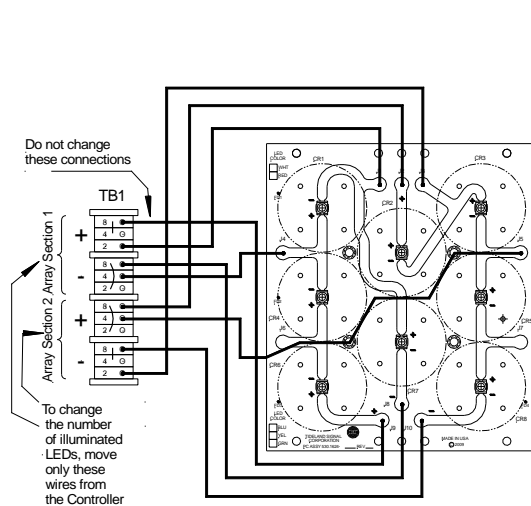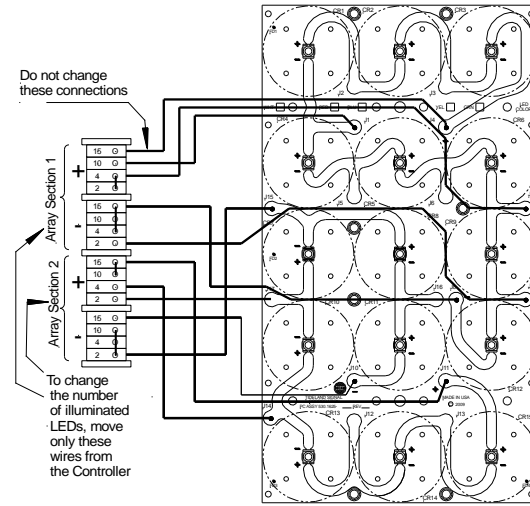
8-Head LEDBullet   15-Head LEDBullet

Numbers on the *outside* of the terminal board correspond to the number of LEDs lit. Move **all** jumpers on the outside terminals to properly configure the number of LEDs for the required intensity setting. WARNING: Never move jumper wires while LEDFlasher is powered. Intensities requiring two LEDs will have the four wires inserted into the respective terminals labeled "2", etc.

Next, select the power setting. Microswitch S5 shown on page 14 is used to set the power level. In the 4 digit power level, "0" refers to OFF and "1" refers to ON. Reading from left to right, use your small flat blade screwdriver to set the microswitch to the proper power setting.

Synchronization

The LEDBullet in a RL14 or FA-240 can be synchronized to another LEDBullet in multi-lantern installations and to an additional/passing light typically located above the range lantern when an all-around signal is desired. This configuration can be used to replace a 250mm with a condensing panel. The LEDBullet, when operated as a master unit will sync with a CG-504 flasher (or an existing "slave" flasher) set to the "sync" setting on the programmable control and the Vega VLB-67-SA (standalone lantern) equipped with a sync converter module. Additionally, the LEDBullet will sync with Tideland Signal Corporation's MLED-120 omnidirectional LED lantern (specify "sync" option when ordering lantern).

155mm Lantern Synchronization

To sync the LEDBullet to a legacy 155mm lantern using a CG6P lampchanger and CG-504 flasher, connect the "sync" wire from the LEDBullet to the "S/Sy" terminal of the CG-504 flasher (no daylight control installed on the CG-504). Turn the program dial on the CG-504 to the "Sync" setting and the 155mm will only turn on and flash in unison when the LEDBullet operates. If separate power systems are used, the negative leads from both battery banks must be tied together to provide a common ground reference for both lanterns.

LEDBullet or MLED-120 Lantern Synchronization

To sync the LEDBullet to another LEDBullet (for multiple lanterns used in the daytime) or to a Tideland MLED-120 omnidirectional LED lantern (used as a passing light at night), use the ACSI output from the LEDBullet flasher. Do not use the sync wire already wired to the LEDFlasher. Attach a wire to the center terminal of block J6, as shown below to the center "Sync" terminal of the MLED-120 (also shown below).
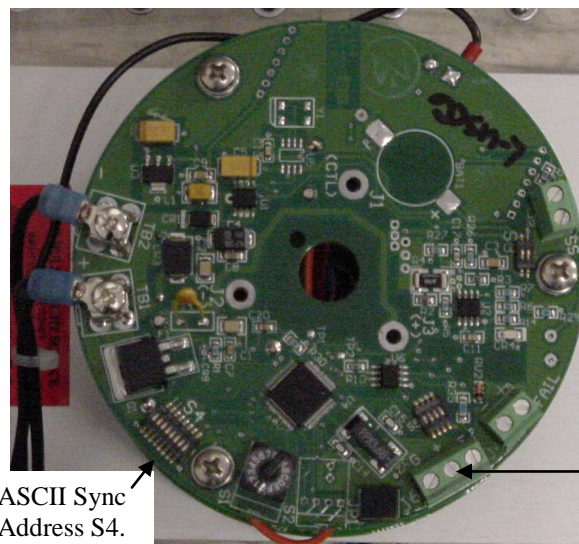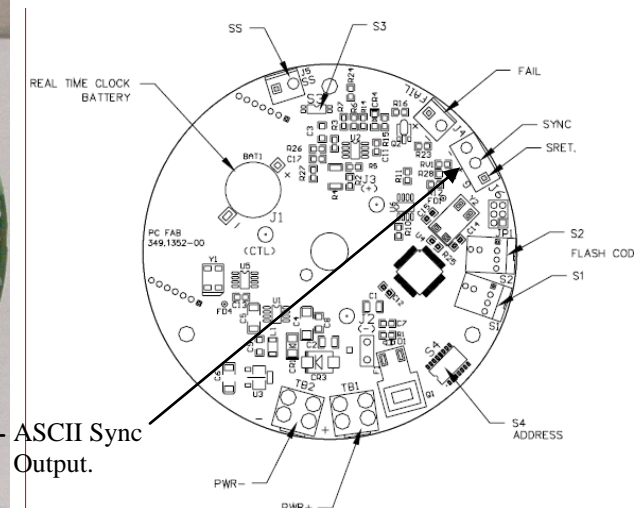
LEDBullet Flasher   MLED-120 Lantern

The sync address of the LEDBullet(s) and MLED-120 must be set (microswitch S4). The Master LEDBullet on the left is set to address 0 (all switches OFF or down). The address for the Slave unit (other RLEDBullet or MLED-120) is set to 1 (left switch in the ON position; all other switches OFF).
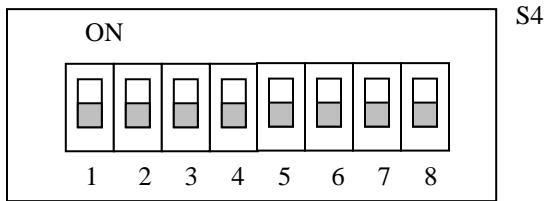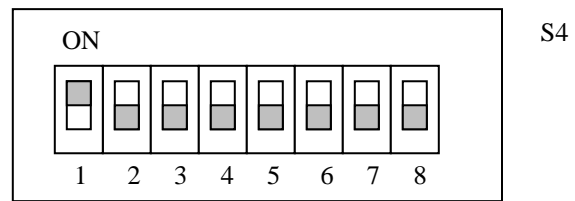
Master LEDBullet   Slave LEDBullet or MLED-120

If separate power systems are used, the negative leads from both battery banks must be tied together to provide a common ground reference for both lanterns.

VLB-67-SA Synchronization

To sync the LEDBullet to a Vega VLB-67-SA (stand-alone) lantern, the sync pulse must be inverted by a sync convertor mounted in the base of the lantern (available from the SILC ATON/MER Product Line). To install the convertor, open the lantern by removing the four fasteners using an 8mm or 5/16" nut driver and #3 square drive screwdriver. Note there are washers under the screws in the top of the lantern (don't lose them).

VLB-67-SA Opened   Sync Convertor Installed

Mount the sync convertor in the base using the two supplied screws with the components on the circuit card facing up. Write with a Sharpie the word "Sync" on the base.

Disconnect the power lead connector (follow the leads from the cable gland to the connector). Connect the sync convertor to the input power lead connector and the other connector to the leads from the lantern. Plugs are polarized so they only fit one way. There are unused connectors in the lantern. This is normal.

Carefully tuck the wires back into the base of the lantern. Be sure the O-rings are seated properly on both sides of the square frame and carefully close the lantern being sure that wires are not pinched. Reinstall the fasteners and tighten (do not over tighten them).

Sync Convertor Connected   Green/Yellow Sync Lead

The VLB-67-SA must be programmed to the same rhythm as the LEDBullet. In addition, you must program the VLB-67-SA to the desired intensity. See the VLB-67 manual on our website (http://www.uscg.mil/hq/cg4/cg432/2a_ledinstructions.asp) for programming instructions. The VLB-67-SA must be programmed as a Sync Master using the following sequence (this is a failsafe mode such that the VLB-67-SA will continue flashing the programmed rhythm if the sync pulse from the LEDBullet is lost). This sequence can be programmed at the same time the flash rhythm and intensity are programmed (just enter this sequence after the intensity or rhythm is programmed):

1 3 0 0 0   (**1 3 9 9 9 to disable synchronization**)

The VLB-67-SA will flash the programmed rhythm when powered, and will sync to the LEDBullet when the green/yellow sync lead from the VLB-67-SA is connected to the Sync Pulse lead from the LEDBullet when both are powered using the same power system.

Day/Night Dimming

A powerful feature of the LEDBullet is that it can be configured to change intensity based on input from a daylight control. One LEDBullet (in one lantern) can therefore satisfy both daytime and nighttime lighting requirements if the required intensities fall within the capabilities of the LEDBullet. A limitation, at this time, is that the number of LEDs lit cannot change when the lantern transitions from day to night - what changes is the electrical current to the LEDs. Early LEDBullets did not have this day/night dimming feature but all LEDBullets purchased since July 2013 have this capability.

The night intensity level is based on the *maximum* intensity for the number of LEDs energized during the day. For example, if you have a 15-head LEDBullet, Fixed White, all LEDs energized, set to 540,000 candelas (power setting 1000) and you need 65,000 candelas for the nighttime intensity, the power level will be 10% (650,000 candelas; max intensity for a 15-head White LED, x 0.10 (10%) = 65,000 cd). The power consumption at night will be 10% of the current based on the 650,000 intensity value (3.482 amps x 0.10 = 0.3482 amps). If the minimum power level produces an intensity that is too high for the nighttime signal, a second lantern must be installed to satisfy the nighttime intensity requirements. Note: the calculated intensities for the lower power levels may be conservative. As current is reduced, the LEDs become more efficient (less heat) and may produce intensities higher than calculated. You may have to reduce the intensities further (if not at the 6% setting already) to satisfy users.

ON [ ][ ][ ][ ][ ][ ][ ][ ] S4
1 2 3 4 5 6 7 8
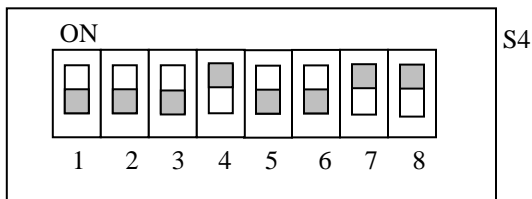
Example: 35% Power Level

	S4 Switch Settings			
Power Level	#4	#5	#6	#7
100%	OFF	OFF	OFF	OFF
90%	ON	OFF	OFF	OFF
80%	OFF	ON	OFF	OFF
70%	ON	ON	OFF	OFF
60%	OFF	OFF	ON	OFF
55%	ON	OFF	ON	OFF
50%	OFF	ON	ON	OFF
45%	ON	ON	ON	OFF
40%	OFF	OFF	OFF	ON
35%	ON	OFF	OFF	ON
30%	OFF	ON	OFF	ON
25%	ON	ON	OFF	ON
20%	OFF	OFF	ON	ON
15%	ON	OFF	ON	ON
10%	OFF	ON	ON	ON
6%	ON	ON	ON	ON

Microswitch S4, switch 8 must be ON to activate the dimming feature. The above table details the power/intensity level for the dimming feature. Switches 4 through 7 must be set to the position corresponding to the desired power level.

The Range Solar Sizing Program can be used to identify both day and night intensity options. After selecting the RL14 spread lens, light color, LEDBullet & daytime intensity, the user is then shown the available night intensity options.

Bench Test

Flip the LEDBullet over so that it is resting on the circuit board on a soft cloth with the LEDs point straight up to the ceiling. Do not attach a daylight control to the LED flasher/driver at this time. Connect the power leads from the LEDBullet to a 12 VDC power source (power supply or ATON battery), check the number of LEDs lit and flash rhythm (**do not look directly into the LEDs as eye damage may result**). Allow the assembly to operate for 24 hours. Note that there is a sync lead that may not be used (do not allow it to contact the power source or terminals). Clip that lug and insulate with a wire nut or remove the wire from the terminal block if the sync option is not used.

Installation – RL14

The LED assembly replaces the existing flasher, lampchanger, lamps and mirror in the RL14 range lantern. The existing color spread lens will likely remain in the lantern. Clear glass may be used for some applications, as directed in the district work order.
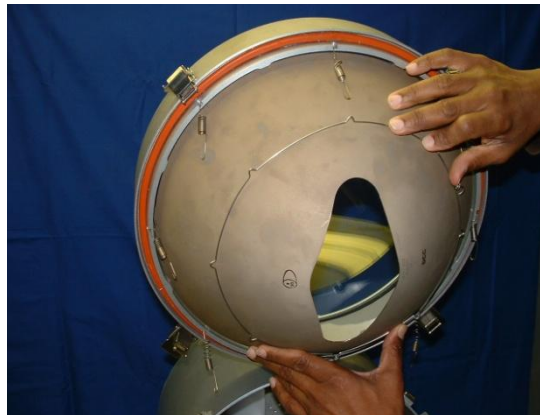
Remove the protective plate on the terminal strip and disconnect the power leads from the flasher at this terminal strip in the back of the lantern. Remove the leads from the daylight control at the "S S" terminals at the flasher (leave the daylight control (if installed in the lantern). Remove the lampchanger and flasher assembly from the RL14. Remove the spacer blocks from the back of the lantern.

CG-6P AND TF-3B
CG-4P/250W
LC-300/100W
(T3.5 BULB)
CG-4P/100 150W
(T-4 BULB)
REMOVE THESE
BLOCKS
CG-4P/100 150W
(T-4 BULB)
LC-300/100W
(T3.5 BULB)
CG-6P AND TF-3B
CG-4P/250W
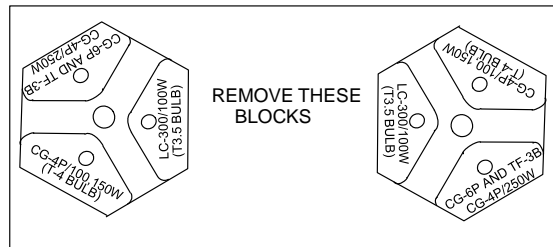
View inside the drum with terminal strip cover, lampchanger, flasher and spacer blocks removed. Use tape to orient the 12/2 SO power cable from the Battery/ATON Power Supply as shown (only two leads are used in a 12 VDC system without sync). It is important that the leads are routed this way to prevent them from getting pinched when the LEDBullet is installed.
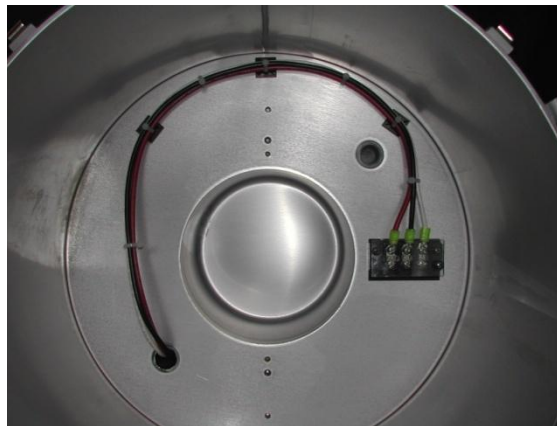
Remove the mirror by releasing the springs securing it to the bezel. Hold the mirror while the springs are removed to prevent it from dropping and breaking (it is glass). Carefully pack it for return to the ANT. Clean the lens with a cloth and a non-abrasive cleaner (mild soap and water).

Place a soft cloth in the bottom of the drum and lay the LEDBullet face down inside the drum.
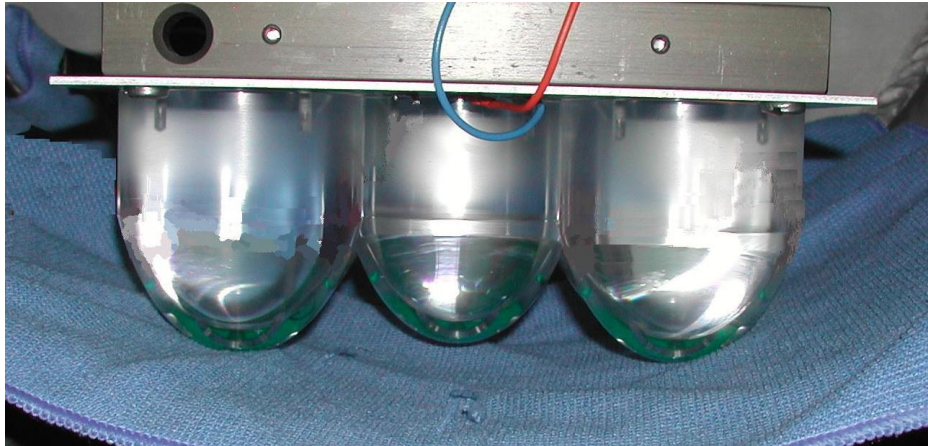
Wire the power leads from the LEDBullet to the terminal strip in the back of the drum. The leads are labeled "+", "-" and "sync". The protective cover may be installed, if desired, but is not necessary for 12 VDC applications.

Clip the spade lugs from the daylight control, strip ¼" of insulation from both leads and connect the daylight control leads to terminal strip J5 on the LED flasher/driver. Be sure all wire strands go into the terminal block (to prevent shorting).

Place several drops of thermal paste on the rear of the two mounting brackets and spread evenly over the rear surface, as shown below.
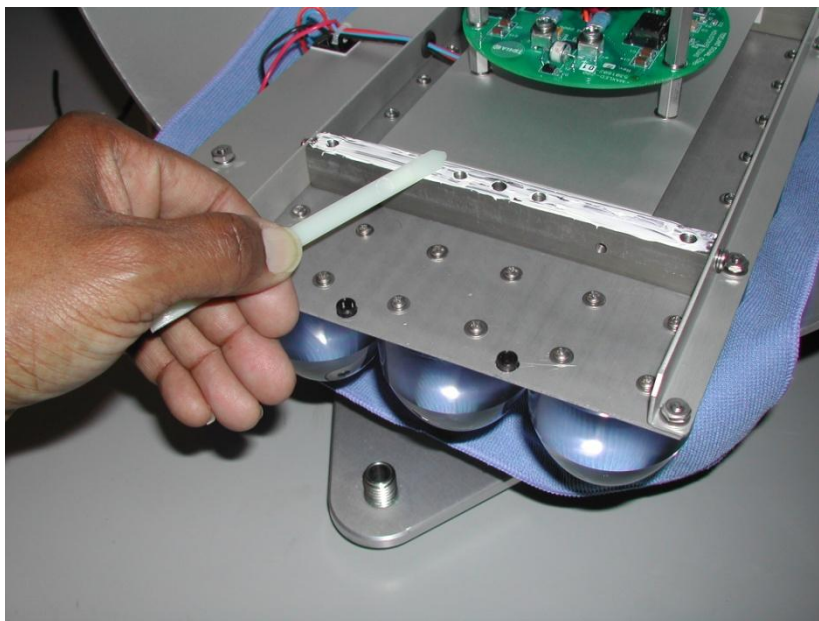
Locate the LED Conversion Kit on the back plane of the RL14 Lantern, secure with the two Hex Cap Screws with Flat Washers in the holes at the back of the lantern (where the spacer blocks were), and tighten.

Hex Cap Screws
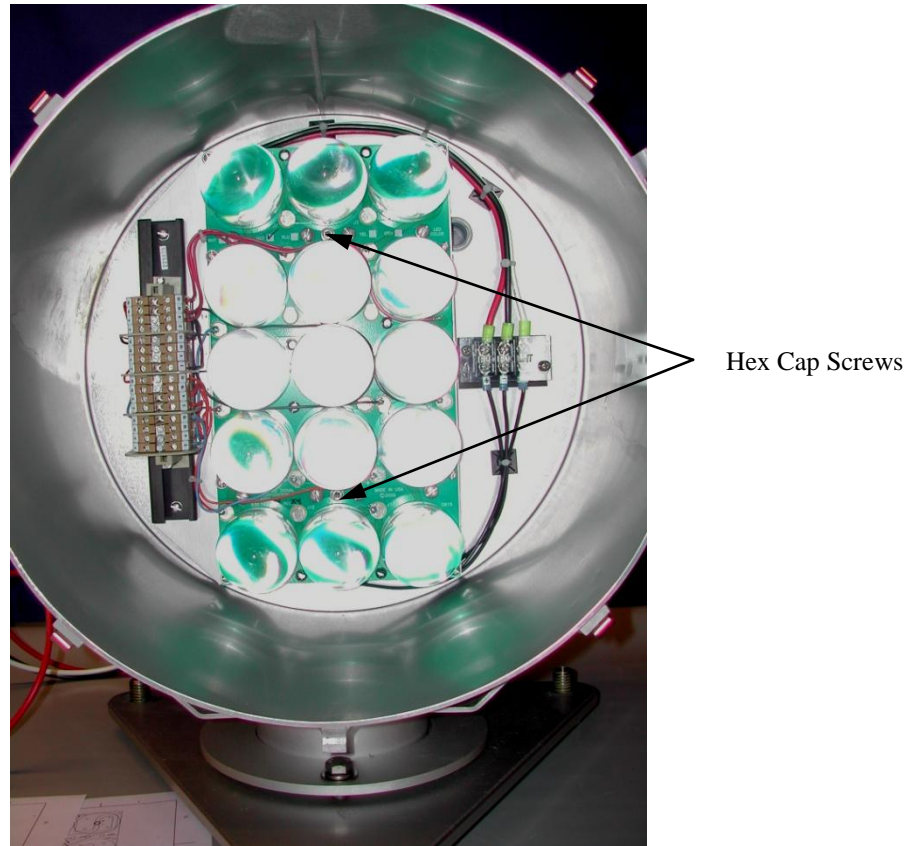
Cover the daylight control and ensure that the LEDs turn on (**Do not look into the LEDs**).

Note: It is strongly suggested that desiccant bags be installed in the drum to prevent condensation inside the lens and to protect the electronics. Silica-Gel desiccant bags are available from McMaster-Carr Supply Company, www.mcmaster.com, search under "desiccant bag." Use the largest bag that will fit in the drum that does not obstruct the lower LEDs. Replace the desiccant bag when servicing the lantern.

Close the cover and latch it into place. The LEDs should project small beams of light on the lens of the lantern. Check the two spirit levels on top of the beacon to ensure that the lantern is level. Adjust, if necessary, by loosening the mounting bolts and turning the threaded sleeves in the base, then retightening the mounting bolts.

Note the orientation of the spread lens. The "lines" in the lens should go up and down, as shown on the next page:

Verify beam realignment with a boat crew observing the range at distance. Remove tape from daylight control prior to departure.

Installation – FA-240

The LED assembly replaces the existing flasher, lampchanger, lamps, spider bracket, standoffs and mirror in the FA-240. The existing color spread lens will remain in the lantern.

Secure power to the lantern and remove the V-band retaining the rear cover. Disconnect the power and daylight control leads from the flasher (if power is not secured ensure that the power leads do not short). Remove the 4 screws securing the flasher/lampchanger spider to the lantern. It can be removed as one assembly with the flasher and lampchanger attached. Retain the screws for installation of the LEDBullet. Using an adjustable wrench, remove all four standoffs that located the spider bracket.

Remove the 3 screws securing the mirror inside the lantern. Remove the mirror, but leave the mirror standoffs inside the lantern (they are not used).

Remove the lugs from the two daylight control leads and strip ¼" of the insulation off each wire.

Remove the lugs from the power leads and strip ¼" of the insulation off each wire. Route the power and daylight control leads out the back of the lantern so they can be connected to the LEDBullet flasher

Install the LEDBullet on the mounts in the drum using the 4 screws that secured the spider bracket, as shown below, with the power leads and daylight control wires through the bottom access.

Daylight Control Terminals

Input Power
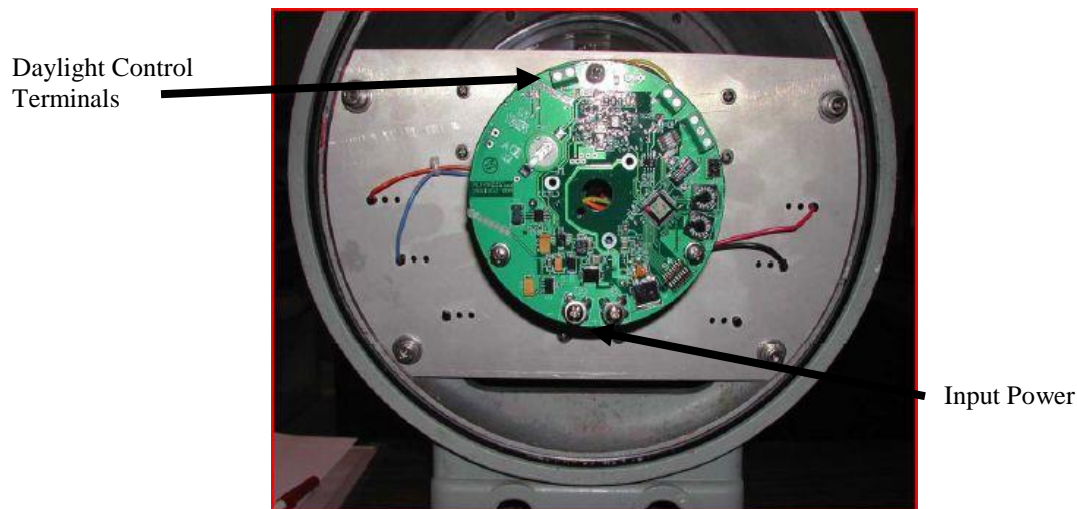
Connect the power leads to the terminals located at the bottom of the circuit board and the daylight control terminals to the terminals at the top of the circuit board.

Cover the daylight control, apply power and note if the LEDs turn on. There will be small round projections on the spread lens when viewed from the front of the lantern.

Note: It is strongly suggested that desiccant bags be installed in the base to prevent condensation inside the lens and to protect the electronics. Silica-Gel desiccant bags are available from McMaster-Carr Supply Company, www.mcmaster.com, search under "desiccant bag." A couple of 4"x6" bags will fit neatly in the base of the lantern and will not obstruct the LEDs. Replace the desiccant bags when servicing the lantern.

Replace the rear cover and secure with the V-band.

Verify that the lantern is level. Adjust, if necessary, by loosening the mounting bolts and turning the threaded sleeves in the base, then retightening the mounting bolts.

Verify beam realignment with a boat crew observing the range at distance. Remove tape from daylight control prior to departure.

Service Life

The maximum service life is determined by the operational hours of the LEDs, the intensity setting and the ability to maintain the advertised intensity over that term, limited by the durability of the lens and lantern housing. Service life will be longer at less than the maximum intensity setting. Replace the LEDBullet when it can no longer provide an acceptable signal to the mariner.

Fixed/Oc4 **10** years (at maximum intensity)

FL/Q/Iso rhythms **20** years (at maximum intensity)

Servicing

- The lantern shall not be opened unnecessarily on-station as doing so introduces salt air inside it (visual inspection can be accomplished by looking through the spread lens to check for proper rhythm and that the required LEDs are lit).

- The service interval for these LED based aids is three years.

- The service life of the lantern depends on the operational duty cycle and durability of the lantern, discussed above. The LEDs will not burn out, but intensity degrades over time.

- Ensure that the lens is clean, not discolored or crazed. Wipe with a cloth dampened with mild soap and water, if necessary. Replace if not clear, otherwise cracks could compromise its strength or light transmission (note: only a small portion of the actual lens is used with the new LED system).

- Inspect the wiring and power system in accordance with the Short Range Aids to Navigation Servicing Guide. Load test the battery.

- Cover the daylight control to ensure that the lantern flashes on rhythm. Observe the LEDs through the lens. If one or more LEDs are out the LED assembly should be replaced at the earliest convenience after posting a local notice to mariners (Note: on some installations not all LEDs are lit).

- If the lantern fails for any reason, replace it with another LED assembly or reinstall the mirror, a conventional programmable flasher, lampchanger, DLC and lamps. Do not mix and match parts if replacing the LED assembly. The flasher/LED driver is matched to each LED head assembly. Contact the SILC ATON/MER Product Line for hardware disposal/disposition.

Troubleshooting

No light.

- ➢ Check voltage at the battery terminals. Minimum voltage is 10-volts to operate (10.5 or less indicates a dead battery). No reduction in LED intensity will occur at this voltage. Replace battery, if necessary.

- ➢ Check voltage at LED flasher input terminals at the back of the lantern ("+" and "-"). If low voltage at the flasher but battery voltage is good, replace/meg power cable.

- ➢ Disconnect external daylight control. If light operates, replace the Type-L daylight.

- ➢ If light fails to operate with daylight control removed, replace the LED assembly.

Improper rhythm

- ➢ Check the position of the code selection switch.

- ➢ Disconnect one lead from the battery, wait 10 seconds, then reconnect. This reboots the processor.

- ➢ If the LED still has an improper rhythm, replace the LED assembly.

Note: The LED flasher and LED head are matched sets. Do not mix and match components when troubleshooting. Replace the entire assembly.

Various LEDs out (note: not all LEDs are lit in some applications)

➢ If one or more LEDs do not light (note aid file or FID to determine how many LEDs *should* be lit), replace the LED assembly. If a replacement is not immediately available, continue using the LED assembly until a replacement can be secured. If two or more LEDs fail, replace the assembly. Note: All LEDBullets are equipped with dual power supplies so failure of half of the programmed LEDs is possible. This is a failsafe condition to prevent total loss of light. The range will still be serviceable at this reduced intensity, but the LEDBullet should be replaced when feasible.

Light will not turn off

➢ Be sure that the daylight control is connected to the **"SS"** terminals on the LED Flasher/Driver.

➢ Apply a jumper between the "SS" terminals. If the light turns off, replace the daylight control.

➢ If the light does not turn off with the jumper in place, replace the entire LEDBullet assembly.

Specific problems, concerns, observations and questions may be directed to your District Training Team Chief in DPW or NATON.

Please report all problems to the SILC ATON/MER Product Line

Replacement

Contact Tideland Signal for a Return Authorization (RA) number and ship failed LED assemblies the following address:

Tideland Signal Corporation
4310 Directors Row
Houston, TX 77092
713-681-6101

Reporting Requirements

Unit, Sector, and District I-ATONIS/AAPSilver/AIMS users shall use the latest data entry procedures for entering LED Bullets and associated equipment into the I-ATONIS database.

In addition to the I-ATONIS data entry procedures, enter the 4-digit LEDBullet power setting and, for day/night applications, the nighttime power level (as a percentage) in the I-ATONIS aid remarks section so that this information will be available on the Federal Information Document (FID) for the particular range light.